MASS. HS 63.2: W81/2

UMASS/AMHERST

312066016544312

WOBURN CHILDHOOD LEUKEMIA FOLLOW-UP STUDY

GOVERNMENT DOCUMENTS COLLECTION

DEC 05 1997

University of Massachusetts Depository Copy

INFORMATION BOOKLET

The purpose of this information booklet is to provide a summary of the Woburn Childhood Leukemia Follow-Up Study. All details of the study methods and results could not be presented in this short format. However, the booklet provides information on where these details can be obtained.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL HEALTH ASSESSMENT
July 1997

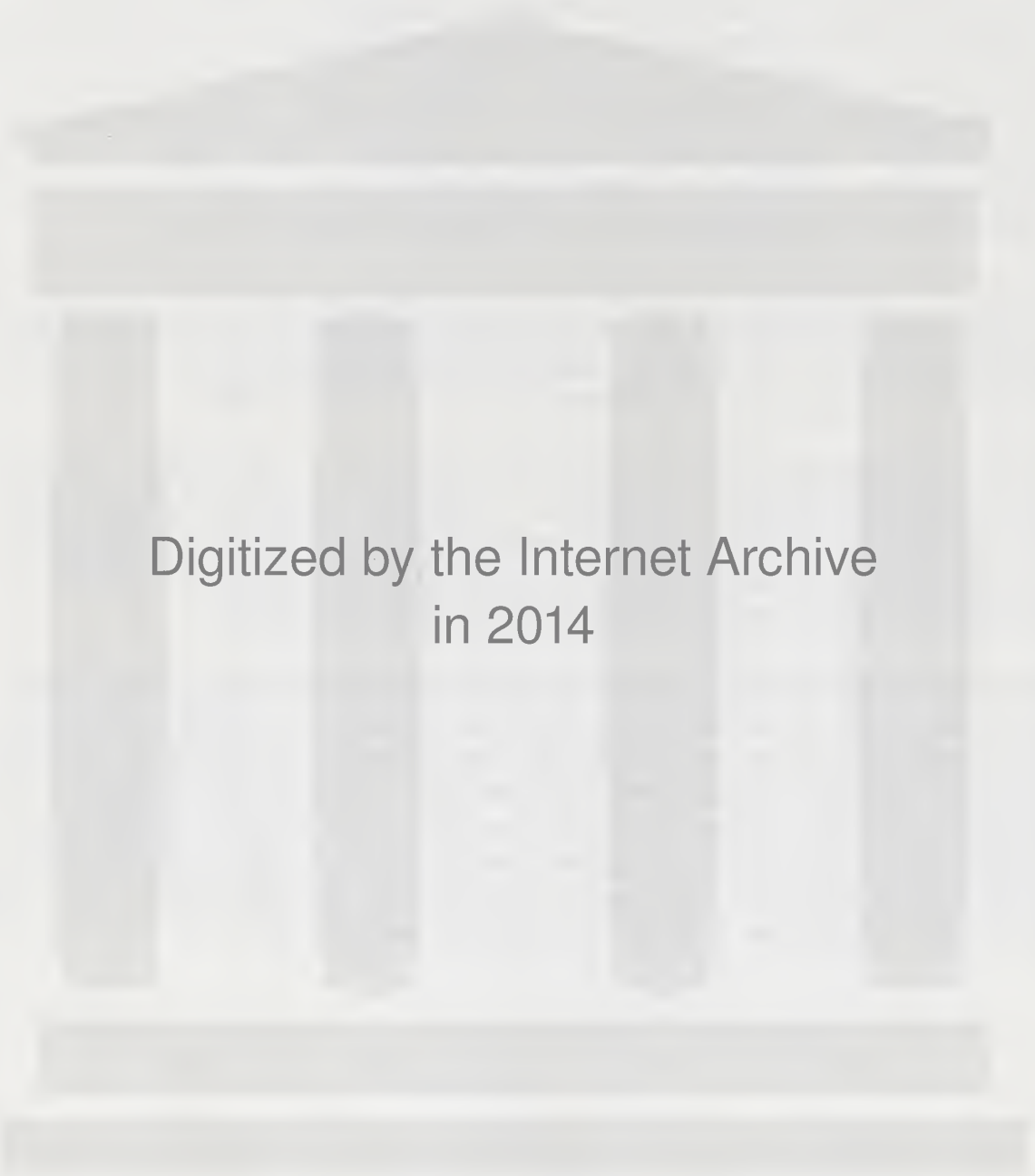
Woburn Childhood Leukemia Follow-Up Study

Woburn, Massachusetts is a community of approximately 35,000 people, located 13 miles northwest of Boston. It has an extensive industrial history spanning over 130 years. Manufacturing resulted in the deposition of hazardous materials and waste products including arsenic compounds, tannery waste, and heavy metals. Beginning in 1979, excavation of a former industrial site unearthed significant amounts of industrial waste. In June of 1979 it was learned that two municipal drinking water wells located near the site and in use since 1964 were contaminated with trichloroethylene (TCE), perchloro-ethylene, chloroform, and other organic compounds. The contaminated wells were immediately closed. Between January 1969 and December 1979, twelve cases of childhood leukemia were diagnosed in Woburn. Six of these cases resided in a six-block area served directly by the contaminated wells.

Results of a 1981 case-control investigation conducted by the Massachusetts Department of Public Health (MDPH) confirmed the elevated incidence of childhood leukemia in Woburn, particularly among males. By 1986 nine additional cases had been diagnosed. As a result, MDPH conducted the an expanded Childhood Leukemia Follow-Up Study.

The study is a matched case-control design with matching based on date of birth, sex, race, and dates of residence in Woburn. Residential, occupational, and health history data were collected for children and families during in-person interviews with parents. Residential history information was linked to hydrologic estimates of contaminated well water flow patterns to derive exposure level estimates for case and control households.

A relationship between exposure and leukemia was identified for exposure which occurred during the time the mother was pregnant with the study cases (O.R. = 8.33, C.I. = 0.73, 94.67). A weaker association was identified for maternal exposure beginning two years before conception and ending at conception of the leukemia case. Although small numbers of cases limit statistical power, a significant trend across exposure categories was identified for the period during pregnancy ($p < 0.05$) suggesting a dose response relationship for mothers who drank contaminated water during pregnancy. Results must be interpreted with caution as small numbers of study subjects lead to imprecise estimates of leukemia risk.



Digitized by the Internet Archive
in 2014

https://archive.org/details/woburnchildhoodl00mass

QUESTIONS AND ANSWERS

Q1. What is the Woburn Childhood Leukemia Follow-Up Study?

A1. The Woburn Childhood Leukemia Follow-Up Study was proposed to provide further insight into the causes of childhood leukemia among persons nineteen years of age or younger who were diagnosed with leukemia between January 1, 1969 and August 31, 1989 and were residents of Woburn at the time of their diagnosis. This work serves to supplement previous efforts of the Massachusetts Department of Public Health (MDPH) which confirmed the increased incidence of childhood leukemia in Woburn.

The objective of the study was to re-analyze the original data set by obtaining additional information for the twelve childhood leukemia cases included in the 1981 investigation and to expand the study to include 9 more cases diagnosed as of August, 1989. The investigation has utilized a refined water distribution model which allowed for a more precise exposure assessment. The model was made available from the Woburn Environment and Birth Study which was completed in 1994. In addition MDPH utilized information regarding potential causes of cancer not available at the time of the original MDPH study. It directly evaluates the relationship between the opportunity for exposure to water from Wells G and H and childhood leukemia incidence and how other potential risk factors may have contributed to the increased incidence.

Q2. What did the study find out about the risk of childhood leukemia in Woburn and its relationship to the consumption of water drawn from the contaminated wells?

A2. Findings should be interpreted with caution due to the limitations of conducting statistical analyses on small populations. The conclusions suggest however, that the risk of developing childhood leukemia was greater for a child whose mother drank water from the contaminated wells while pregnant with the child. The results also suggest that the greater the amount of contaminated water provided to the house and available for use while the mothers were pregnant the greater the risk of their child developing leukemia.

Q3. Why was the study done?

A3. In 1979, two hazardous waste sites were discovered in Woburn and were subsequently placed on the U.S. Environmental Protection Agency's National Priority List. One of the sites encompassed the area around wells G and H which at the time were part of the Woburn municipal water supply. A study conducted by MDPH in 1981 confirmed the existence of a significant elevation in childhood leukemia incidence but the unavailability of appropriate environmental data limited its capacity to study

associations between childhood leukemia incidence and exposure to potential environmental contaminants.

Q4. Who conducted the study?

A4. The Woburn Childhood Leukemia Follow-Up Study was conducted by the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health Assessment (BEHA).

Q5. What were the goals of the study?

A5. The study was conducted to re-analyze the twelve original cases from the 1981 childhood leukemia study and to expand the study to include the additional 9 cases diagnosed as of August 1989. All 21 cases would be reassessed using more refined scientific methods of exposure assessment through the use of a well water distribution prediction model unavailable at the time of MDPH's original study.

Q6. How were controls selected for this study?

A6. As the geographic distribution of cases is fairly random throughout Woburn, controls for this analysis were randomly selected from among Woburn residents. Two controls were selected for each of the 21 cases matched on race, sex, and date of birth. Controls must have been Woburn residents at the time of the diagnosis of the matched case.

Q7. How was the study done?

A7. Cases diagnosed prior to 1982 were identified from the original MDPH study and by reviewing medical records in one of the four medical centers which diagnose and treat children with childhood leukemia in the Boston area. Cases diagnosed since 1982 were identified from the Massachusetts Cancer Registry. Matched controls which met the control selection criteria were selected from school rosters of public school cases.

Parents of cases and controls were then contacted and asked to participate in an in-person interview which gathered information including residential history information for the mother and child, occupational history information for the mother and father, medical information for the mother and child, and lifestyle information.

The information concerning place and length of residence for subject families in Woburn was linked to exposure information derived from the Murphy water distribution model to generate exposure scores which represented the amount of contaminated water received by each study subject household.

Q8. How were the cases and controls compared to determine if potential consumption of contaminated water increased the risk of leukemia?

A8. Exposure values representing the relative amount of exposure to Wells G and H were generated for cases and controls. In order to determine if the risk of leukemia was significantly increased for those children who were exposed to contaminated water when compared to those who were not, a statistic called the "odds ratio" and its 95% confidence interval was calculated. The odds ratio represents how many times more (or less) likely a particular outcome, such as leukemia diagnosis, occurred among cases as compared to the matched control population. An odds ratio value of 1.0 indicates no difference between the case and control population. The 95% confidence interval indicates whether the calculated odds ratio is significantly different from a value of 1.0. If the 95% confidence interval excludes the value of 1.0 then the odds ratio is statistically significant.

Q9. Were characteristics of the study subjects other than their water consumption patterns considered as possible contributing factors to the childhood leukemia onset?

A9. Differences between study subjects for certain characteristics such as age of the mother at birth of the child, maternal smoking history, maternal alcohol consumption, maternal occupational exposures, and maternal x-ray exposure, can produce differences in the rates of certain diseases. To control for the potential effect of these characteristics on childhood leukemia, a statistical procedure known as logistic regression was used to adjust the odds ratios for those population differences.

Q10. Which risk factors, in addition to consumption of potentially contaminated water, showed a relationship to childhood leukemia incidence?

A10. There was a statistically significant association between having been breast-fed and childhood leukemia incidence. Maternal exposure to dental X-ray showed a similar relationship as well. Statistical analyses are based upon a small number of cases and thus potentially unreliable statistical results. The effect of breast-feeding or maternal X-ray exposure on childhood leukemia incidence remains unclear.

Q11. Which chemical contaminants from wells G and H were of concern to the residents of Woburn?

A11. The primary chemical contaminants of wells G and H that were of concern were trichloroethylene and tetrachloroethylene. Other contaminants identified included chloroform, 1,2 dichloroethylene, and arsenic.

Q12. How was it possible to be exposed to the contaminants in the water?

A12. The potential for exposure to the chemicals in the water for the period when the wells were operating (1964-1979) was through direct contact with water, especially from drinking but also through other means, such as bathing, cooking, etc.

Q13. How was exposure to water from wells G and H determined?

A13. Two factors were used to estimate exposure. One factor was the proportion of all public-supplied water reaching any specific Woburn area on a monthly basis that came from wells G and H. The second was the street address of the study subject beginning with the mother's address from two years prior to conception through the birth of the study subject including the study subject's address to the date of diagnosis of the case. A water distribution model developed by Peter Murphy, Ph.D., combined these factors to produce an estimate of each study subject's exposure to water from Wells G and H.

Q14. How does this study compare with other studies examining the same types of environmental contaminants and leukemia incidence in Woburn?

A14. Previous studies were limited by less environmental exposure data and conducted at a time when fewer childhood leukemia cases had been identified. Study methods were thus more limited in their ability to demonstrate associations between environmental exposures and leukemia incidence.

Q15. Was the study peer reviewed?

A15. A Peer Review Panel was established consisting of experts in epidemiology, toxicology, and statistics. The panel reviewed the quality and content of the data analysis, results and conclusions of the study. The panel members were:

Chairperson and Environmental Epidemiologist	David Savitz, Ph.D. University of North Carolina
Environmental Toxicologist	Nancy Kim, Ph.D. New York State Department of Health
Statistician	Edward Stanek, Ph.D. University of Massachusetts

A peer review panel comprised of experts in hydrology had previously reviewed and provided suggestions for the final version of the water distribution model.

Q16. What were the findings and recommendations of the Peer Review panel?

A16. It was the opinion of the Peer Review Panel that the study is well-suited to addressing the potential relationship between consumption of contaminated water from wells G and H in relation to childhood leukemia. The peer reviewers felt the methods used in this study are current and appropriate. They state that the principle limitation in the study is the limited number of leukemia cases for this analysis. They felt the conclusions presented in our peer review version of the study report may have been too strong in light of this resulting imprecision. Observations from the peer review panel were incorporated into the report.

Q17. What other environmental data were collected as part of the Woburn Childhood Leukemia Follow-Up Study?

A17. The report also examined potential exposures from 60 Hz Electric and Magnetic Fields (60Hz EMFs) as a contributing factor to childhood leukemia incidence in Woburn. This research focused on the assessment of power line configuration coding as a method of assessing EMF exposure rather than actual field measurements. The majority of residences in the Woburn study population demonstrated power line configurations which are characteristic of low exposure to EMF. None of our analyses demonstrated statistically significant relationships between power line configuration code as an indicator of EMF exposure and childhood leukemia.

Q18. What risk does the water supply currently pose to Woburn residents today?

A18. No known risk currently exists from the public water supply in Woburn. Wells G and H have not been in operation since 1979. Other wells, including the Horn Pond wells, are routinely checked for various types of chemicals and for various pesticides by the Massachusetts Department of Public Health. The results have indicated no contamination.

Q19. Has the Massachusetts Department of Public Health been involved in any other health and/or environmental investigations in Woburn?

A19. The MDPH and the Massachusetts Health Research Institute in collaboration with the Division of Birth Defects and Developmental Disabilities, U.S. Centers of Disease Control and Prevention (CDC) conducted the Woburn Environment and Birth Study (WEBS) released in August 1994. This study examined the incidence of birth defects in Woburn and compared these rates to those of other similar communities.

The Massachusetts Department of Public Health, (DPH) has released the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) Health Assessment for wells G and H and Industriplex. These reports are a compilation of selected environmental data regarding wells G and H and Industriplex and an assessment of the present and future public health implications of the sites in terms of the various potentials for exposure from current contamination and remediation activities.

Q20. What if I lived in Northeast Woburn while pregnant but my child hasn't been diagnosed with leukemia? Should I be concerned?

A20. The MDPH uses data collected by the Massachusetts Cancer Registry to closely follow cancer incidence trends for each city and town throughout the State. Childhood leukemia incidence trends for Woburn have not been elevated in recent years.

Wells G and H have been closed since June 1979. The group of children in the Woburn population whose mothers could have potentially been exposed to the wells, are now nearly all into adulthood. Although MDPH will continue to closely follow childhood leukemia incidence in Woburn, patterns of incidence suggest that any elevation in incidence resulting from exposure to Wells G and H has already been observed.

Q21. Where can I get more information on the Woburn Childhood Leukemia Follow-up Study?

A21. You can call or write:

The Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
250 Washington Street, 7th Floor
Boston, MA 02108
(617) 624-5757